

THE INVENTION CLAIMED IS:

1. A method of manufacturing successive spherical glass articles, in each of which is accommodated a three-dimensional object or figurine, which method comprises the following steps, to be performed in a suitable sequence, of:

- (a) providing a container with a mass of molten glass for delivering liquid glass;
- (b) providing thermally resistant figurines;
- (c) wholly enclosing successively at least one figurine by feeding molten glass to the figurine from at least two sides;
- (d) portioning the molten glass before or after step (c) such that molten glass masses are formed, in each of which a figurine is embedded;
- (e) providing a flow of liquid glass from the container;
- (f) guiding the liquid glass flow such that at least two parts thereof are obtained simultaneously, and positioning the figurine in between these parts; and
- (g) modeling these masses to a spherical form by substantially omnidirectional rolling for a time with simultaneous cooling so that the glass solidifies.

2. The method according to claim 1, wherein step (f) comprises guiding the at least two parts in two different directions.

3. The method according to claim 2, wherein step (f) comprises at least two separate parts.

4. The method according to claim 1, wherein the container comprises a discharge opening through which the liquid glass can be delivered, and wherein step (f) comprises guiding the glass flow continuously.

5. The method according to claim 4, wherein at least two molten glass flows are provided and in that step (c) comprises enclosing the figurine in between the molten glass flows.

6. The method according to claim 5, further comprising the steps of:

- (h) providing a central mandrel in the container for supplying figurines;
- (i) delivering a flow of at least two differently directed glass parts, while simultaneously supplying successive figurines intermittently;
- (j) causing the glass flow to contract and thus embedding the successive objects in between at least two moving glass parts of the flow;
- (k) successively separating the lower part of the glass flow in which a figurine is situated such that still molten glass masses are formed, in each of which a figurine is embedded.

7. The method according to claim 6, wherein step (h) further comprises the vertical tubular central mandrel extending into the discharge opening such that a tubular flow of liquid glass can be delivered via the discharge opening, and wherein

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step (i) further comprises supplying the figurines via the mandrel such that these objects are received in the hollow space of the glass flow.

8. The method according to claim 6, wherein step (k) takes place using a number of concave rollers together bounding a round passage opening.

9. The method according to claim 8, wherein the rollers are driven at an increased peripheral speed reinforcing the contraction of the glass flow.

10. The method according to claim 8, wherein the rollers have partly spherical cavities co-acting in register positions during rotation.

11. The method according to claim 6, further comprising the step of

- (l) performing step (i) after pre-heating the successive figurines.

12. The method according to claim 11, wherein the successive figurines are preheated to about 850°C.

13. The method according to claim 1, wherein at least two glass masses are formed before step (c) and wherein step (c) comprises enclosing the at least one figurine between the at least two glass masses.

14. The method according to claim 13, wherein at least two separate glass masses are formed before step (c).

15. The method according to claim 1, wherein cooling of the spherical article takes place in step (g), by progressing through the temperature path from the annealing temperature to the strain temperature at a chosen speed such that cooling takes place in a substantially stress-free manner.

16. The method according to claim 1, further comprising the step of :
(h) annealing after step (g) by again fully heating the spherical glass articles to remove internal stresses and subsequently cooling slowly.

17. The method according to claim 16, wherein the spherical glass articles are slowly cooled to about 50°C.

18. The method according to claim 1, wherein step (c) is performed by cutting through the glass flow between the figurines.

19. The method according to claim 18, wherein use is made of two plates with co-acting, generally concave, substantially V-shaped cutting edges.

20. The method according to claim 18, wherein the discharge opening can be closed by a valve.

21. The method according to claim 20, wherein the mandrel has a widened lower part which can co-act as valve body with the mouth edge of the discharge opening serving as valve seat.

22. The method according to claim 1, wherein step (g) is performed by means of a first roller in which is recessed a helical groove with smooth round form, which roller is driven rotatably at a first peripheral speed and co-acts with a second roller driven at a second peripheral speed differing from the first peripheral speed, which second roller is smooth or likewise provided with a helical groove.

23. The method according to claim 1, wherein each figurine is provided beforehand with a glaze coating comprising at least one oxide from the group of which Si, Al, Na, Mg, Zr form part, with coloring pigments on the basis of elements from the group of which Fe, Pb, Cr form part.

24. The method according to claim 23, wherein the glazing of the figures consists substantially of the following constituents:

61.5 % SiO_2

14.7 % Al_2O_3

4.7 % Na_2O

6.6 % K_2O

11.2 % CaO

1.3 % rest.

25. A spherical glass article in which a figurine is arranged, obtained by applying a method as claimed in claim 1.

26. A method for manufacturing an object of glass with at least one three-dimensional figurine enclosed therein, comprising the following steps:

introducing an amount of glass having a desired temperature, at which the glass is soft, into a mold cavity;

pressing a heated figurine into the glass; and

pressing the amount of glass with the figurine present therein substantially to a desired shape.

27. The method according to claim 26, wherein the temperature of the figurine upon being inserted into the glass is higher than that of the glass.

28. The method according to claim 27, wherein the temperature of the figurine is in the range of about 100°C to about 1200°C.

29. The method according to claim 27, wherein the temperature of the figurine is about 1150°C.

30. The method according to claim 26, wherein the figurine is pressed into the glass via an insertion hole in a mold in which the mold cavity is located.

31. The method according to claim 30, wherein a vacuum is utilized.

32. The method according to claim 30, wherein a mold comprising a cover and a number of bottom molds are used for forming the object, wherein each of said bottom molds is provided with a hole.

33. The method according to claim 32, wherein a first bottom mold including a first hole, a second bottom mold including a hole, and a third bottom mold including a hole are used.

34. The method according to claim 30, wherein the glass object with the figurine enclosed therein is compressed in a mold which is provided with a small escape hole.

35. The method according to claim 34, wherein a vacuum is utilized.

36. The method according to claim 34, wherein a mold comprising a cover and a number of bottom molds are used for forming the object, wherein each of said bottom molds is provided with a hole.

37. The method according to claim 36, wherein a first bottom mold including a first hole, a second bottom mold including a hole, and a third bottom mold including a hole are used.

38. The method according to claim 26, wherein the glass provides a free-space, at the location where the figurine is to be inserted, prior to the insertion of the figurine.

39. The method according to claim 26, wherein an amount of glass is used for forming the object which is larger than the amount that is eventually needed.

40. The method according to claim 26, which is used for manufacturing spherical objects, wherein the objects, after being removed from the mold cavity, immediately or after partial reheating, are placed on one of a roller, where they are given their final shape, and placed, after cooling off, in one of a tumbler and a bead fine grinding machine/bead calibrating machine, whereafter the objects are polished.

41. The method according to claim 40, wherein the objects are polished by one of tumbling and flame polishing on a roller.

42. The method according to claim 26, wherein the objects are annealed in an annealing furnace for a period of at least three hours.

43. The method according to claim 42, wherein the period is about six hours.

44. A device for manufacturing an object of glass with a three-dimensional figurine enclosed therein, comprising a mold provided with a mold cavity, whose shape corresponds at least substantially to the shape of the object, wherein said mold is provided with an insertion hole extending between the mold cavity and the environment of the mold, which is used for introducing the figurine into the mold cavity.

45. The device according to claim 44, wherein the mold is so designed that holes having varying diameters, which connect to the mold cavity, can be formed therein.

46. The device according to claim 44, wherein said mold comprises a stamp and a number of bottom molds, which bottom molds each include a hole connecting to the mold cavity, wherein the various holes have varying diameters.

47. The device according to claim 44, comprising a vacuum system for generating a vacuum in and around the mold, at least upon insertion of the figurine into the glass mass in the mold.